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Experiences with selecting search engines using metasearch

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↑ ABSTRACT

Search engines are among the most useful and high-profile resources on the Internet. The problem of finding information on the Internet has been replaced with the problem of knowing where search engines are, what they are designed to retrieve, and how to use them. This article describes and evaluates SavvySearch, a metasearch engine designed to intelligently select and interface with multiple remote search engines. The primary metasearch issue examined is the importance of carefully selecting and ranking remote search engines for user queries. We studied the efficacy of SavvySearch's incrementally acquired metaindex approach to selecting search engines by analyzing the effect of time and experience on performance. We also compared the metaindex approach to the simpler categorical approach and showed how much experience is required to surpass the simple scheme.

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↑ INDEX TERMS

Primary Classification:

H. Information Systems

↳ H.3 INFORMATION STORAGE AND RETRIEVAL

Additional Classification:

H. Information Systems

↳ H.3 INFORMATION STORAGE AND RETRIEVAL

General Terms:

Algorithms, Experimentation

Keywords:

WWW, information retrieval, machine learning, search engine

↑ REVIEW

"Donald Harris Kraft"

A solid background in the concept of Web search engines and metasearch engines, and some experiments on SavvySearch, a metasearch engine designed by the authors, are provided in this paper. It includes easy-to-follow definitions of concepts necessary to an understanding of information retrieval, Web search engines, and metasearch engines. It is nice to see that concepts such as search engines (designed to aid in finding Web sites, given the exponentially growing number of sites) and metasearch engines (designed to aid in deciding which search engines to use, given the rapid growth in search engines), which have been known for years by library and information scientists, are being rediscovered by computer scientists. The authors note that a metasearch engine must have a dispatch mechanism to determine which search engines to employ, an interface agent to adapt a user query into a query suitable for each search engine employed, and a display mechanism by which to return the search results to the user. The paper provides a good literature search of available metasearch engines along with their Web site URLs. The authors explain how SavvySearch uses the keywords in the user's query to rank potential search engines that will eventually rank Web sites deemed relevant to the query. They note that the top search engines can be made to search in parallel. In order to rank search engines, they keep track of term frequencies at the sites searched by each search engine, and they keep track of the frequencies of success and failure of each search engine in terms of finding relevant sites for specific terms. The ranking of the search engines is accomplished by a complex formula based on concepts analogous to ranking via term weights in standard document retrieval. The ranking includes considerations of concurrency, expected network load, and local CPU load. One nice feature of the search engine ranking mechanism is the inclusion of thresholds for response times, leading to penalties for slow searches. The paper provides the results of a series of experiments with SavvySearch. A pilot study looked at how well search engines were being selected. The authors used a large set of queries (at least 2500). They varied the ordering of the search engines and the selection of the first group of search engines to be employed. Results indicate that their approach is viable, that users like the basic approach, that users follow more links found at the beginning of a search, and that past query success can be used to improve future searches. Further experiments looked at SavvySearch enhancements, such as penalties for lack of results and frequent updating of the meta-index, which is the data structure for information about search engine successes and failures and for term frequencies. Results were mixed, but, in general, SavvySearch's approach is a good one. The bottom line is that SavvySearch has garnered increased interest and use. It takes some experience for the system to learn enough about what is out there to improve on categorical searches done by other means. The approach is especially effective at figuring out where not to search. The authors continue to search for more efficient ways to use the Web to find relevant information. [*Online Computing Reviews Service*](#)

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1 [Experiences with selecting search engines using metasearch](#)



Daniel Dreilinger, Adele E. Howe

 July 1997 **ACM Transactions on Information Systems (TOIS)**, Volume 15 Issue 3

Publisher: ACM Press

Full text available: pdf(428.65 KB)

 Additional Information: [full citation](#), [abstract](#), [references](#), [citings](#), [index terms](#), [review](#)

Search engines are among the most useful and high-profile resources on the Internet. The problem of finding information on the Internet has been replaced with the problem of knowing where search engines are, what they are designed to retrieve, and how to use them. This article describes and evaluates SavvySearch, a metasearch engine designed to intelligently select and interface with multiple remote search engines. The primary metasearch issue examined is the importance of carefully selecti ...

Keywords: WWW, information retrieval, machine learning, search engine

2 [Interest-based personalized search](#)



Zhongming Ma, Gautam Pant, Olivia R. Liu Sheng

 February 2007 **ACM Transactions on Information Systems (TOIS)**, Volume 25 Issue 1

Publisher: ACM Press

Full text available: pdf(1.58 MB)

 Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Web search engines typically provide search results without considering user interests or context. We propose a personalized search approach that can easily extend a conventional search engine on the client side. Our mapping framework automatically maps a set of known user interests onto a group of categories in the Open Directory Project (ODP) and takes advantage of manually edited data available in ODP for training text classifiers that correspond to, and therefore categorize and personalize s ...

Keywords: Open Directory, Personalized search, World Wide Web, information retrieval, user interest, user interface

3 [Industry session 3: data analysis, mining, and managing XML: Intelligent metasearch engine for knowledge management](#)



Eui-Hong Han, George Karypis, Doug Mewhort, Keith Hatchard

November 2003 **Proceedings of the twelfth international conference on Information and knowledge management CIKM '03**

Publisher: ACM Press

Full text available:  pdf(368.32 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The explosive growth of available information sources and the resulting information overload pose several problems for users in many business organizations and educational institutions. First, searching through several information sources, one at a time, is a source of enormous frustration for users. Second, top-ranked documents in search results are frequently irrelevant to what users are interested in. To address these problems, we have developed ixmeta™, a powerful metasearch engine tha ...

Keywords: clustering, collaboration, collection fusion, library automation, metasearch, personalization

4 Comparing the performance of collection selection algorithms



Allison L. Powell, James C. French

October 2003 **ACM Transactions on Information Systems (TOIS)**, Volume 21 Issue 4

Publisher: ACM Press

Full text available:  pdf(668.40 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The proliferation of online information resources increases the importance of effective and efficient information retrieval in a multicollection environment. Multicollection searching is cast in three parts: collection selection (also referred to as database selection), query processing and results merging. In this work, we focus our attention on the evaluation of the first step, collection selection. In this article, we present a detailed discussion of the methodology that we used to evaluate an ...

Keywords: Collection selection, database selection, distributed information retrieval, distributed text retrieval, metasearch engine, resource discovery, resource ranking, resource selection, server ranking, server selection, text retrieval

5 Automated discovery of search interfaces on the web

Jared Cope, Nick Craswell, David Hawking

January 2003 **Proceedings of the 14th Australasian database conference - Volume 17 ADC '03**

Publisher: Australian Computer Society, Inc.

Full text available:  pdf(205.10 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Web search engines work well for finding crawlable pages, but not for finding datasets hidden behind Web search forms. We describe a novel technique for detecting search forms, which could be the basis for a next-generation distributed search application. We use automatic feature generation to describe candidate forms and C4.5 decision trees to classify them. In two testbeds, we get an accuracy of more than 85% and a precision of more than 87%. One of our decision trees is effective on both test ...

Keywords: distributed information retrieval, machine learning, world wide web

6 OAI application: Extending SDARTS: extracting metadata from web databases and interfacing with the open archives initiative



Panagiotis G. Ipeirotis, Tom Barry, Luis Gravano

July 2002 **Proceedings of the 2nd ACM/IEEE-CS joint conference on Digital libraries**

JCDL '02**Publisher:** ACM PressFull text available:  pdf(303.33 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)


SDARTS is a protocol and toolkit designed to facilitate metasearching. SDARTS combines two complementary existing protocols, SDLIP and STARTS, to define a uniform interface that collections should support for searching and exporting metasearch-related metadata. SDARTS also includes a toolkit with wrappers that are easily customized to make both local and remote document collections SDARTS-compliant. This paper describes two significant ways in which we have extended the SDARTS toolkit. First, we ...

Keywords: SDLIP, distributed searching, metadata, metasearching, web databases, wrapper construction

7 Search 1: Expert agreement and content based reranking in a meta search environment using Mearf



B. Uygur Oztekin, George Karypis, Vipin Kumar

May 2002 **Proceedings of the 11th international conference on World Wide Web WWW '02****Publisher:** ACM PressFull text available:  pdf(509.92 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Recent increase in the number of search engines on the Web and the availability of meta search engines that can query multiple search engines makes it important to find effective methods for combining results coming from different sources. In this paper we introduce novel methods for reranking in a meta search environment based on expert agreement and contents of the snippets. We also introduce an objective way of evaluating different methods for ranking search results that is based upon implicit ...

Keywords: collection fusion, expert agreement, merging, meta search, reranking

8 Auctions and E-commerce: Paid placement strategies for internet search engines



Hemant K. Bhargava, Juan Feng

May 2002 **Proceedings of the 11th international conference on World Wide Web WWW '02****Publisher:** ACM PressFull text available:  pdf(294.18 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Internet search engines and comparison shopping have recently begun implementing a paid placement strategy, where some content providers are given prominent positioning in return for a placement fee. This bias generates placement revenues but creates a disutility to users, thus reducing user-based revenues. We formulate the search engine design problem as a tradeoff between these two types of revenues. We demonstrate that the optimal placement strategy depends on the relative benefits (to provide ...

Keywords: bias, information gatekeepers, paid placement, promotion, search engines

9 Building efficient and effective metasearch engines



Weiyi Meng, Clement Yu, King-Lup Liu

March 2002 **ACM Computing Surveys (CSUR)**, Volume 34 Issue 1**Publisher:** ACM PressFull text available: Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

 pdf(416.07 KB)[terms](#)

Frequently a user's information needs are stored in the databases of multiple search engines. It is inconvenient and inefficient for an ordinary user to invoke multiple search engines and identify useful documents from the returned results. To support unified access to multiple search engines, a metasearch engine can be constructed. When a metasearch engine receives a query from a user, it invokes the underlying search engines to retrieve useful information for the user. Metasearch engines have ...

Keywords: Collection fusion, distributed collection, distributed information retrieval, information resource discovery, metasearch

10 [A highly scalable and effective method for metasearch](#)



Weiyl Meng, Zonghuan Wu, Clement Yu, Zhuogang Li

July 2001 **ACM Transactions on Information Systems (TOIS)**, Volume 19 Issue 3

Publisher: ACM Press

Full text available:  pdf(653.63 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A metasearch engine is a system that supports unified access to multiple local search engines. Database selection is one of the main challenges in building a large-scale metasearch engine. The problem is to efficiently and accurately determine a small number of potentially useful local search engines to invoke for each user query. In order to enable accurate selection, metadata that reflect the contents of each search engine need to be collected and used. This article proposes a highly scalable ...

Keywords: Database selection, distributed text retrieval, metasearch engine, resource discovery

11 [Incremental clustering for profile maintenance in information gathering web agents](#)



Gabriel L. Somlo, Adele E. Howe

May 2001 **Proceedings of the fifth international conference on Autonomous agents AGENTS '01**

Publisher: ACM Press

Full text available:  pdf(377.14 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

User profiles are the central component of most personalized Web information agents. They consist of a set of models representing the various topics of interest to the user. Often the agent learns the user's preferences from examples of documents deemed relevant to the user. The topic of the document can either be supplied by the user (active modeling), or it must be guessed by the agent (passive modeling), which is more convenient but is expected to diminish the agent's accuracy. We present ...

Keywords: adaptation and learning, information agents, user modeling

12 [Towards a highly-scalable and effective metasearch engine](#)



Zonghuan Wu, Weiyl Meng, Clement Yu, Zhuogang Li

April 2001 **Proceedings of the 10th international conference on World Wide Web WWW '01**

Publisher: ACM Press

Full text available:  pdf(245.18 KB)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: database selection, distributed text database, metasearch engine, resource discovery

13 Towards context-based search engine selection



David B. Leake, Ryan Scherle

January 2001 **Proceedings of the 6th international conference on Intelligent user interfaces IUI '01**

Publisher: ACM Press

Full text available: [pdf\(155.22 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A well-known problem for web search is targeting search on information that satisfies users' information needs. User queries tend to be short, and hence often ambiguous, which can lead to inappropriate results from general-purpose search engines. This has led to a number of methods for narrowing queries by adding information. This paper presents an alternative approach that aims to improve query results by using knowledge of a user's current activities to select search engines relevant to ...

Keywords: distributed information systems, intelligent web search, just-in-time information access

14 Server selection on the World Wide Web



Nick Craswell, Peter Bailey, David Hawking

June 2000 **Proceedings of the fifth ACM conference on Digital libraries DL '00**

Publisher: ACM Press

Full text available: [pdf\(102.88 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Significant efforts are being made to digitize rare and valuable library materials, with the goal of providing patrons and historians digital facsimiles that capture the "look and feel" of the original materials. This is often done by digitally photographing the materials and making high resolution 2D images available. The underlying assumption is that the objects are flat. However, older materials may not be flat in practice, being warped and crinkled due to decay, neg ...

Keywords: World Wide Web, distributed information retrieval, effectiveness evaluation, server selection

15 Personalization and retrieval: Capturing community search expertise for personalized web search using snippet-indexes



Oisín Boydell, Barry Smyth

November 2006 **Proceedings of the 15th ACM international conference on Information and knowledge management CIKM '06**

Publisher: ACM Press

Full text available: [pdf\(288.43 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We describe and evaluate an approach to capturing and re-using search expertise within a community of like minded searchers, such as the employees of a company or organisation. Within knowledge based industries, search expertise - the ability to quickly and accurately locate information according to a specific information need - is an important corporate asset and in our approach we attempt to capture this knowledge by mining the title and snippet texts of results that have been selected by comm ...

Keywords: community, personalization, snippet, web search

16 Image Retrieval from the World Wide Web: Issues, Techniques, and Systems

M. L. Kherfi, D. Ziou, A. Bernardi

March 2004 **ACM Computing Surveys (CSUR)**, Volume 36 Issue 1**Publisher:** ACM PressFull text available: [pdf\(294.13 KB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

With the explosive growth of the World Wide Web, the public is gaining access to massive amounts of information. However, locating needed and relevant information remains a difficult task, whether the information is textual or visual. Text search engines have existed for some years now and have achieved a certain degree of success. However, despite the large number of images available on the Web, image search engines are still rare. In this article, we show that in order to allow people to profi ...

Keywords: Image-retrieval, World Wide Web, crawling, feature extraction and selection, indexing, relevance feedback, search, similarity

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L2	2	1 and dictionary	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:06
L3	2	2 and word	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:07
L4	2	2 and word same dictionary	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:08
L5	2	1 and word same dictionary	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:09
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L7	780	6 and URL and search\$4 and (web adj page)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:11
L8	392	7 and "707"/\$.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:12
L9	69	8 and ((spell\$4 adj check\$4) or spellcheck)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:15

EAST Search History

L10	51	8 and ((spell\$4 adj check\$4) or spellcheck) same (lookup or (look\$4 adj up) or search\$5)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:16
L11	64	8 and ((spell\$4 adj check\$4) or spellcheck) and ((lookup or (look\$4 adj up) or search\$5) with word)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/16 07:16

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Application
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IDS Flag Clearance for Application 09612766

IDS
Information

Content	Mailroom Date	Entry Number	IDS Review	Last Modified	Reviewer
EIDS.	2007-04-03	82	Y <input checked="" type="checkbox"/>	2007-04-10 11:23:56.0	ALy
M844	2007-03-09	81	Y <input checked="" type="checkbox"/>	2007-04-10 11:23:59.0	ALy
M844	2006-03-09	61	Y <input checked="" type="checkbox"/>	2006-08-07 09:29:53.0	ALy
<input type="button" value="Update"/>					